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(52) UK CL (Edition O)

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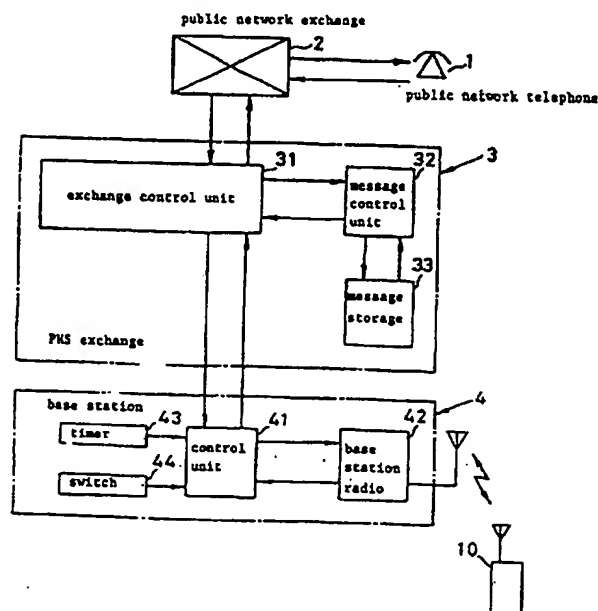
INT CL⁶ H04M 1/64 1/65 3/50 , H04Q 7/22 7/24 7/26
7/30 7/38

ONLINE DATABASE: WPI

(54) Base station for mobile telephone system which disables ringing to mobile telephones

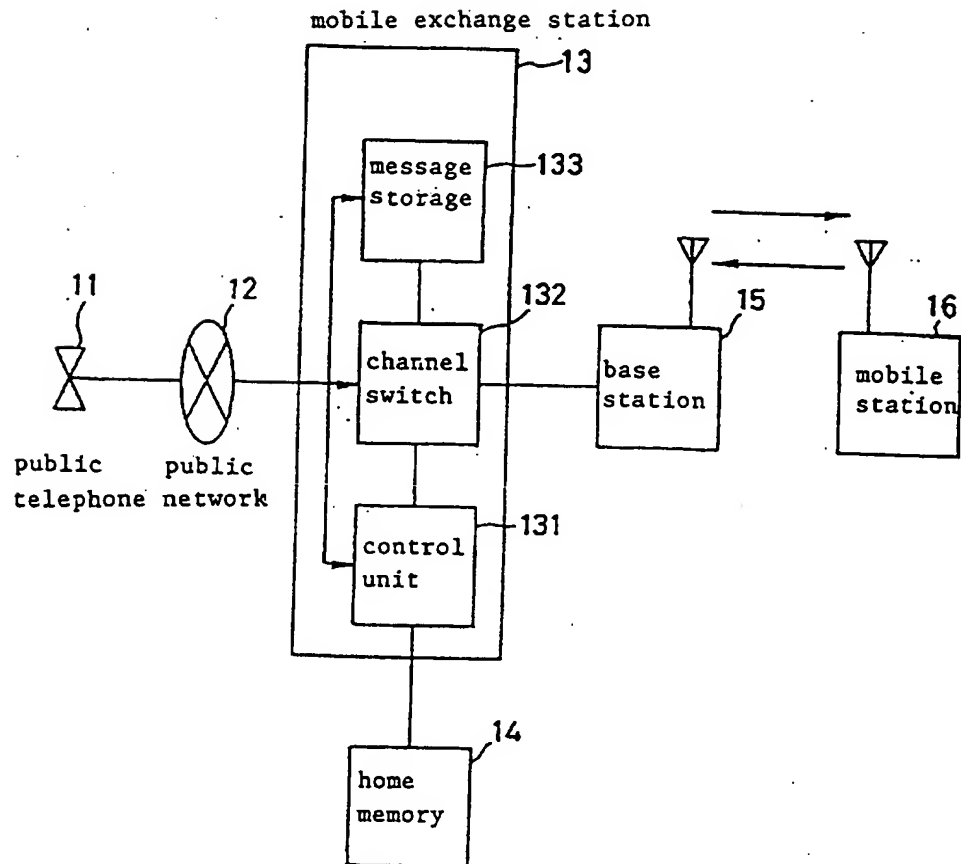
(57) In a mobile telephone system such as a personal handyphone system (PHS), a base station 4 has a non-ringing calling state in which call ringing to mobile telephones registered in its coverage area is disabled. This state is set by a timer 43, which may be set by signals from a mobile telephone. When the base station 4 is in this state, exchange control unit 31 responds to an incoming call from telephone 1 with a recorded message from message control unit 32. The caller may also leave a voice message in message storage unit 33. The mobile is informed (without ringing) that a call has been received and whether a message has been left. The mobile may subsequently make a request for playback of the message stored in the message storage unit. Thus the system defines times and places for which a voice mail service is in operation and ringing is disabled, without requiring an individual mobile telephone to set the voice mail service.

Fig. 4



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Fig. 1 Prior Art



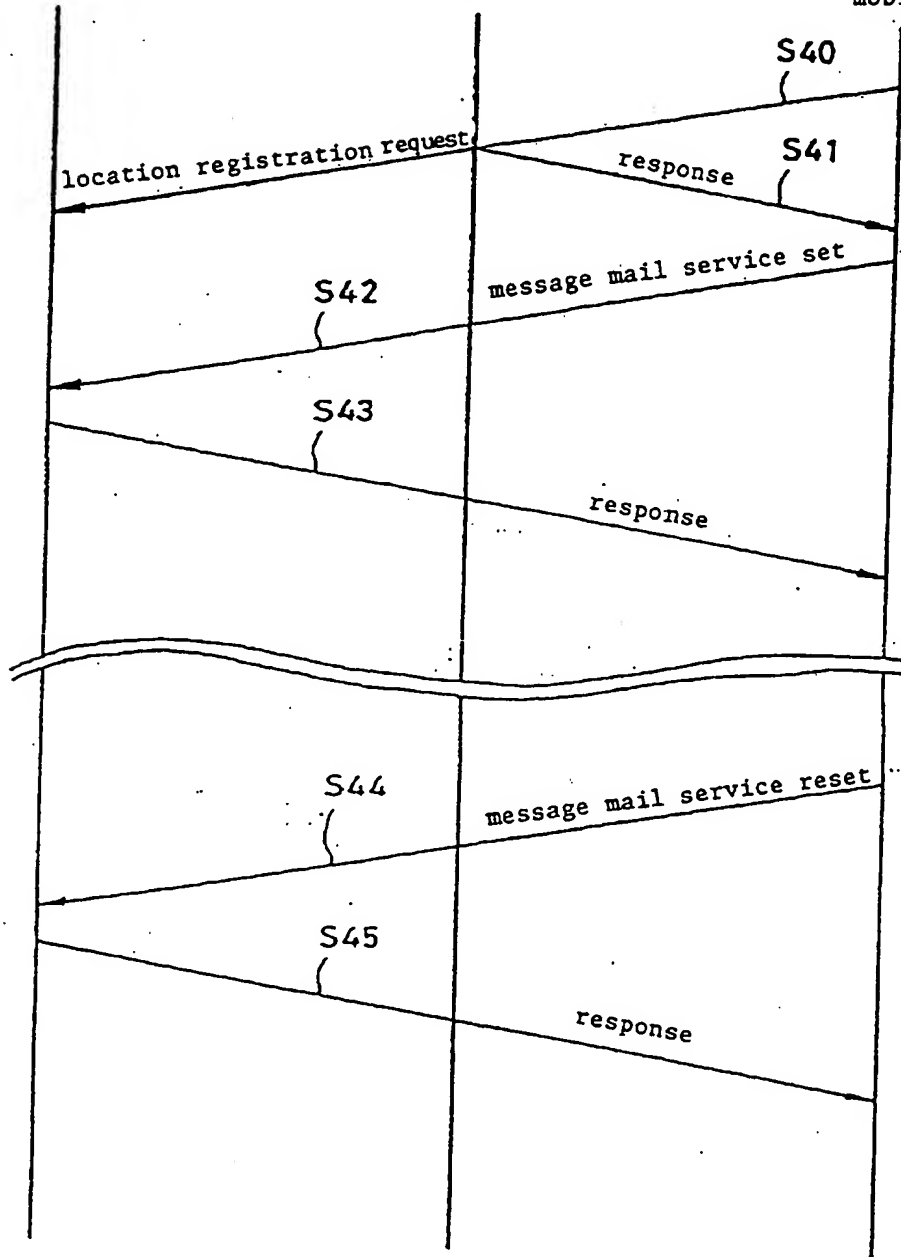
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Fig. 2 Prior Art

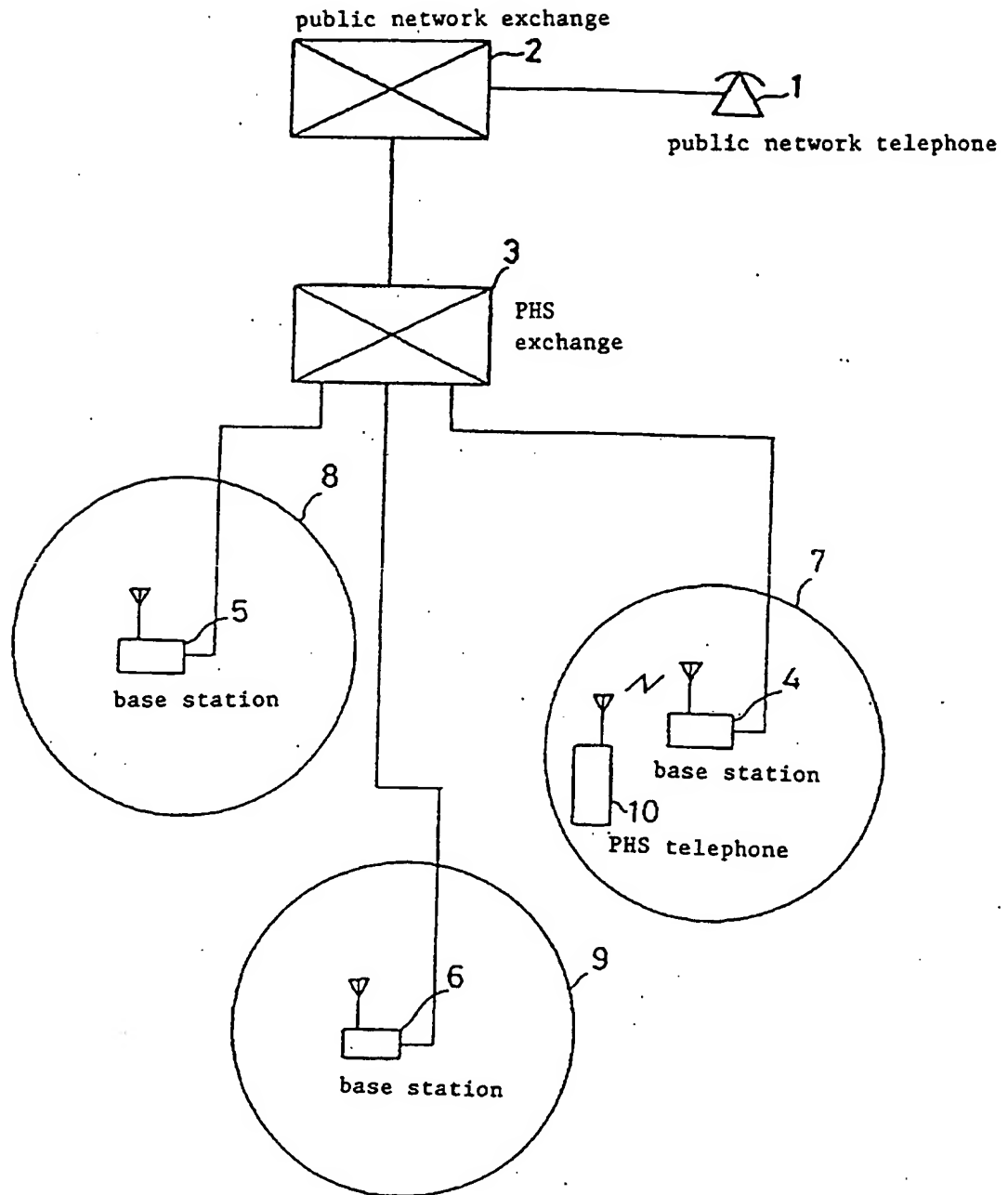
mobile exchange
station 13

base station 15

mobile station 16

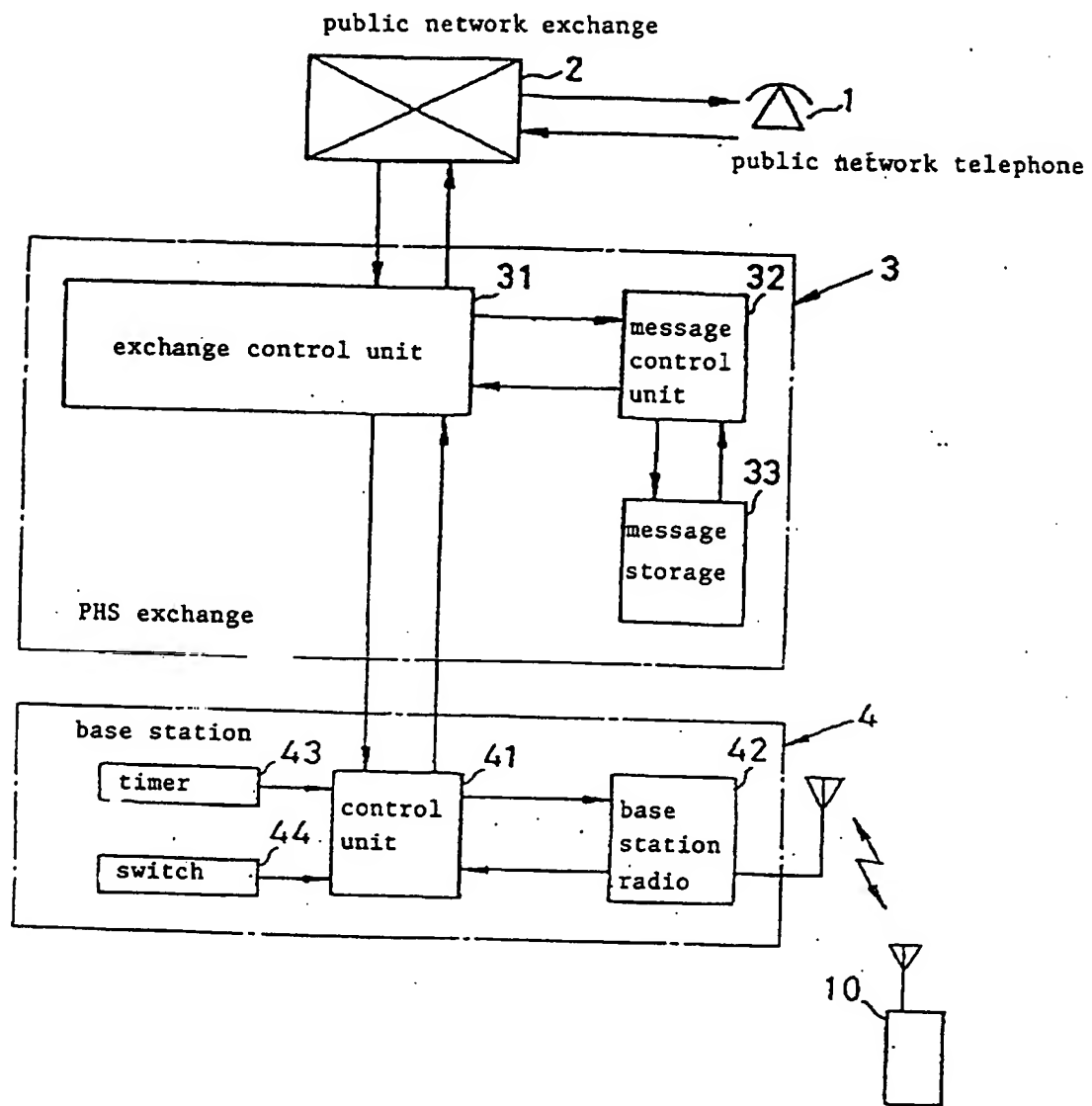


3/7
Fig. 3



4/7

Fig. 4



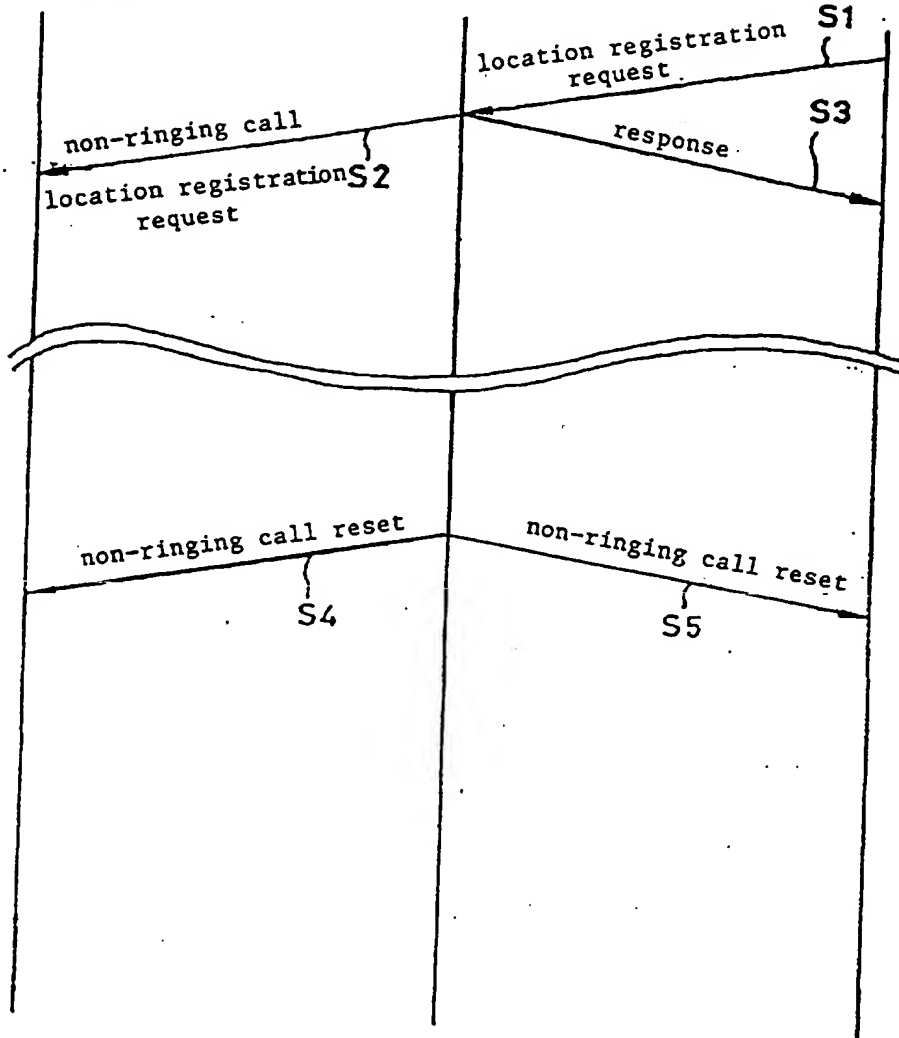
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Fig. 5

PHS exchange 3

base station 4

PHS telephone 10



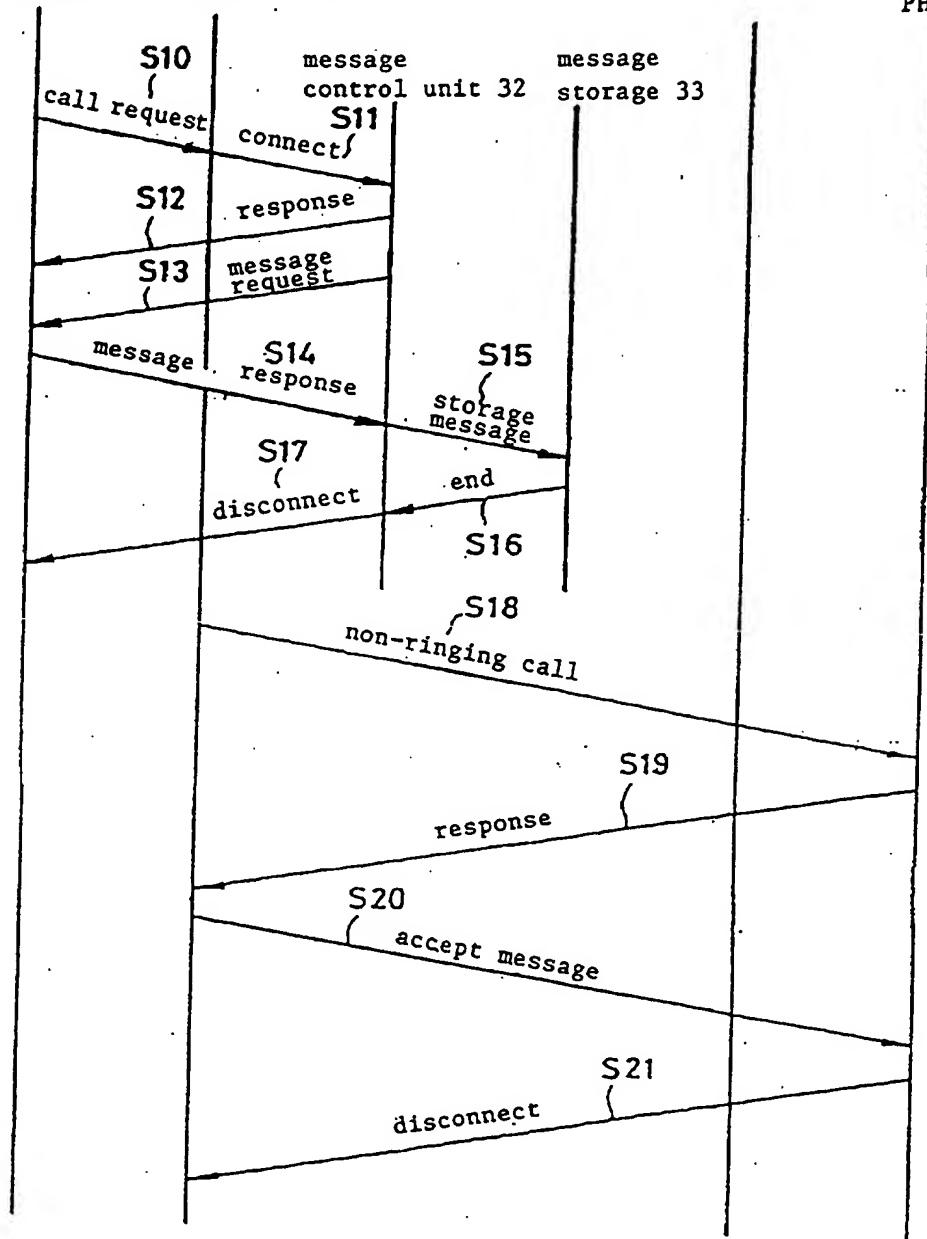
617

Fig. 6

public
networkPHS exchange
control unit 32

base station 4

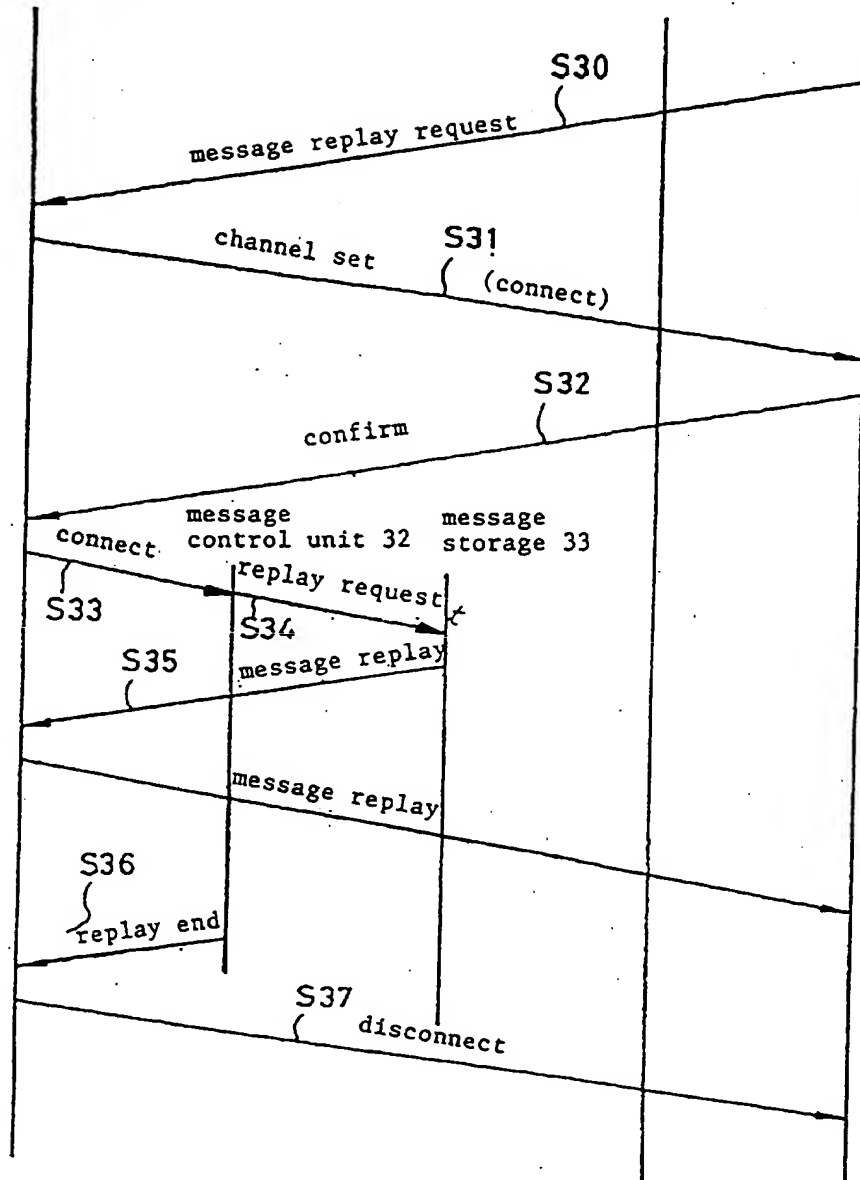
PHS telephone 10



7/7
Fig. 7

PHS exchange
control unit 31

base station 4 PHS telephone 10



MOBILE TELEPHONE AND MOBILE TELEPHONE SYSTEM

The present invention relates to a mobile telephone system, and particularly to a terminating connection control system in a Personal Handyphone System (PHS: Japanese simplified mobile telephone system) and its PHS telephone.

A message mail service system for mobile telephones, including this type of PHS telephone, is described in, for example, Japanese Patent Laid-open No. 54063/94. Terminating connection control systems for such systems have conventionally been call control systems for conveying a message from a caller to the user of a mobile telephone when: the mobile telephone is beyond the range of the service area of a radio base station; the power supply of the mobile telephone is OFF and a line cannot be connected; or the user is in a place where ringing of the mobile telephone is not desired and ringing is deactivated.

Fig. 1 is a system block diagram showing one example of a terminating connection control system for the mobile telephone disclosed in Japanese Patent Laid-open No. 54063/94. This system is made up of

a public telephone 11 from which the call originates, a public network 12 by which public telephone 11 and mobile exchange 13 are connected, a BS (radio base station) 15
5 that transmits and receives radiowaves with the mobile station 16, a channel switch 132 that connects the BS 15 and the public network 12, a voice storage unit 133 that stores voice messages, a home memory 14 that stores reference information including the location of mobile
10 station 16 and the absence or presence of voice messages in voice storage unit 133, and a control unit 131. (It will of course be realized that the mobile station 16 is a station which communicates with mobile units; it is not itself mobile.)

15 Regarding the operation of this system, when there is no response from mobile station 16 after the mobile station 16 is called from the public telephone 11, or when the message mail service is set in the home memory 14 from the mobile station 16, the control unit 131 connects the public
20 network 12 and the voice storage unit 133 together, a voice message from the caller is stored in the voice storage unit 133, and, at the same time, the control unit 131 stores information in the home memory 14 indicating the presence of a voice message.

25 When a new location registration request is received from mobile station 16, control unit 131 refers to the information in home memory 14 indicating the presence or absence of voice messages and relays to mobile station 16 information indicating the presence

of a voice message to mobile station 16.

Fig. 2 is a sequence chart showing the procedure for
5 setting and resetting the message mail service in the
system shown in Fig. 1. A new "location registration
request" (S40) is sent from mobile station 16, and, in
response, base station 15 sends a "response" (S41)
indicating reception of the location registration request
10 to mobile station 16. In response to the new "location
registration request" (S40), mobile exchange 13 registers
the location of the mobile station.

Mobile station 16 sends a "message mail service set"
request (S42), and, in response, mobile exchange 13 sends
15 a message mail service set "response" (S43) to mobile
station 16 and carries out the requested setting process.

When a "message mail service reset" request (S44) is
sent from mobile station 16, mobile exchange 13 sends a
"response" (S45) to the request and carries out the reset
20 process.

A problem with this known system arises if the user of
the mobile telephone (including a PHS telephone) should
forget to make the setting for message mail service. In
the event of an incoming call to a mobile telephone
25 (including a PHS telephone), call ringing will then occur
even when the mobile telephone is at a location where call
ringing is not desired. Another problem arises

if the user of the mobile telephone including a PHS telephone should mistakenly assume that the area where
5 ringing is not desired is outside the service area range and therefore neglect to make the setting for message mail service himself. In that situation, call ringing will occur in the event of an incoming call to a mobile telephone (including a PHS telephone) when the mobile
10 telephone is at a location where call ringing is not desired.

The source of these problems is the necessity for the user of a mobile telephone including a PHS telephone to set the message mail service to the mobile exchange to halt
15 call ringing from the mobile telephone (including a PHS telephone).

The object of at least the preferred embodiments of the present invention is to provide a mobile telephone system that enables the use of a non-ringing call
20 (restraint of call ringing) service within a service area in which times or places in which call ringing is not desired are defined so as to eliminate the need to designate the message mail service to the mobile exchange from individual mobile telephones.

25 The mobile telephone system according to this invention includes a base station and a mobile exchange

that performs exchange and connection between a public network and mobile telephones within the service area of the base station; and the base station further includes
5 control means that effects setting control of a non-ringing call function which restrains the operation of ringing for calls to mobile telephones within its own service area.

The control means preferably includes means for
10 setting start times and end times of the non-ringing call function.

In addition, the control means preferably includes a setting switch that allows the option of manual operation for setting controls of the non-ringing call function, and,
15 moreover, the control means preferably includes means for effecting control such that, when the non-ringing call function is in effect, the non-ringing call function is effected for a mobile telephone within the station's own service area in response to a location registration request
20 by the mobile telephone.

The mobile exchange includes means for responding to calls to a mobile telephone within the service area of a base station and for effecting response control in place of the mobile telephone when the non-ringing call function is
25 in effect; and message storage means for storing messages from a caller.

In addition, the mobile exchange further includes means for notifying a mobile telephone that a call to that
5 mobile telephone has occurred; and further, includes means that, in response to a message playback request from a mobile telephone, plays back a message in a message storage means and sends the played back message to the mobile telephone.

10 The mobile telephone according to the present invention further includes means for requesting playback of a message stored in a message storage means of a mobile exchange.

A mobile telephone system embodying the invention will
15 now be described, purely by way of example, with reference to the drawings, in which:

Fig. 1 is a block diagram showing an example of a prior art system;

Fig. 2 is a sequence flow chart for setting and
20 resetting message mail service in the Fig. 1 system;

Fig. 3 shows the system configuration of the present mobile telephone system;

Fig. 4 is a block diagram showing the construction

of a PHS (Personal Handyphone System) exchange and base station of the system;

5 Fig. 5 is a sequence flow chart showing the location registration operation of a PHS telephone within a service area in which non-ringing calling is in effect and the operation of a base station at the time of ending non-ringing calling.

10 Fig. 6 is a sequence flow chart showing the operation of a PHS exchange during non-ringing calling.

 Fig. 7 is a sequence flow chart showing the operation at a PHS telephone during playback of a voice message stored in the PHS telephone.

15 The general operation of the present system is as follows.

 Setting and resetting of the non-ringing call function of this system is effected from the base station to the mobile exchange. This system therefore does not require
20 requests from individual mobile telephones to the mobile exchange for setting or resetting of the non-ringing call function. In addition, when non-ringing calling is in effect, the mobile exchange responds to calls to each mobile telephone within the service area in place of each
25 mobile telephone. While non-ringing calling is in

effect, messages from callers are held as voice messages in the message storage means within the mobile exchange.

5 Considering the system in more detail, Fig. 3 is a block diagram showing the mobile telephone system, which is composed of: a public network telephone 1; a public network exchange 2 to which public network telephone 1 is connected and which effects transmission and exchange with a mobile
10 network; PHS exchange 3 connected to public network exchange 2 and which effects transmission and exchange with the mobile network; a number of base stations that are handled together by PHS exchange 3, viz base station 4 of service area 7, base station 5 of service area 8, and base
15 station 6 of service area 9; and PHS telephone 10.

Fig. 4 is a block diagram showing the construction of PHS exchange 3 and base station 4. PHS exchange 3 is composed of exchange control unit 31, message control unit 32, and message storage unit 33. Exchange control unit 31
20 controls calling with PHS telephone 10, and incorporates a channel switch that sets up

connections between the line of a caller and message control unit 32 for call requests to PHS telephone 10
5 originating when non-ringing calling is in effect. When non-ringing calling is in effect, message control unit 32 is connected to a caller by way of exchange control unit 31 and sends an explanation message of non-ringing calling or transfers a voice message from the caller to message
10 storage unit 33. Message storage unit 33 is connected to message control unit 32 and has a memory such as a semiconductor or magnetic disk for storing voice messages from a caller.

Base station 4 is composed of base station control
15 unit 41, base station radio unit 42, setting timer 43, and setting switch 44. Base station control unit 41 causes base station 4 to enter a non-ringing calling state when the start of non-ringing calling is conveyed from setting timer 43 or setting switch 44, and to return to normal
20 calling when the end of a non-ringing calling is conveyed from setting timer 43 or setting switch 44. Base station radio unit 42 modulates or demodulates control or speech signals from base station control unit 41 and realizes communication with PHS telephone 10. Setting timer 43
25 incorporates a clock function and conveys to base station control unit 41 the start and end of non-ringing calling for which times have been set. Setting switch 44 is manipulated

to manually effect non-ringing calling and conveys the start and end of non-ringing calling to base station
5 control unit 41.

The operation of the system will now be described. Fig. 5 is a sequence chart showing the location registration operation of PHS telephone 10 in service area 7 during non-ringing calling and the operation of base
10 station 4 at the end of non-ringing calling. When setting timer 43 enters a non-ringing calling start time or when setting switch 44 is manually switched to initiate non-ringing calling, service area 7 of base station 4 becomes a non-ringing calling area.

15 Upon reception by base station 4 of a "location registration request" (S1) originating from PHS telephone 10 in service area 7, the request is sent from base station 4 to PHS exchange 3 as a "non-ringing call location registration request" (S2). PHS exchange 3 identifies PHS
20 telephone 10 as an object of non-ringing calling. With "response" (S3), base station 4 then notifies PHS telephone 10 that service area 7 is a non-ringing call area.

When setting timer 43 reaches the non-ringing calling end time or when setting switch 44 is manually switched to
25 reset non-ringing calling, service area 7 of base station 4 becomes an ordinary call area. A

"non-ringing call reset" (S4) is sent from base station 4 to PHS exchange 3, and, at the same time, base station 4
5 notifies PHS telephone 10 that service area 7 has reverted to a normal call area by "non-ringing call reset" (S5).

Fig. 6 is a sequence chart showing the operation of PHS exchange 3 and base station 4 in the event of a call from a public network telephone 1 to PHS telephone 10
10 within service area 7 when non-ringing calling is in effect. When a "call request" (S10) from public telephone 1 is received by PHS exchange 3, PHS exchange 3 connects public network telephone 1 and message control unit 32 with "connect" (S11), and message control unit 32 sends a
15 "response" (S12) to public network telephone 1 in place of PHS telephone 10.

Message control unit 32 continues by sending as a "message request" (S13) a message including an explanation to public network telephone 1 that that non-ringing calling
20 is in effect and a request to the caller for a voice message.

When the caller at public network telephone 1 sends a message to the receiver at PHS telephone 10, the message is received at message control unit 32 as a "message response"
25 (S14), whereupon message control unit 32 transfers the received "message response" (S14) to message storage unit 33 as "storage message" (S15),

and message storage unit 33 stores the voice message in its own memory.

5 When message storage is completed at message storage unit 33, message storage unit 33 sends "end" (S16) to message control unit 32, and, having received "end" (S16), message control unit 32 requests public network telephone 1 to "disconnect" the line (S17).

10 Exchange control unit 31 effects "non-ringing call" (S18) to PHS telephone 10, and, upon receiving "non-ringing call" (S18), PHS telephone 10 sends "response" (S19) to exchange control unit 31. Upon receiving "response" (S19), exchange control unit 31 sends "accept message" (S20) to
15 PHS telephone 10 to notify PHS telephone 10 that a voice message from the caller at public network telephone 1 has been stored.

After receiving "accept message" (S20), PHS telephone 10 requests exchange control unit 31 to "disconnect" the
20 line (S21).

Fig. 7 is a sequence chart showing the operation of PHS exchange 3 and base station 4 when PHS telephone 10 within service area 7 plays back a voice message from the caller at public network telephone 1 that is stored in
25 message storage unit 33.

PHS telephone 10 sends to exchange control unit 31 a "message replay request" (S30) as a request to play back the voice message from the caller at public

network telephone 1 that is stored in the memory of message storage section 33, and exchange control unit 31 executes
5 a "channel set" (S31) for PHS telephone 10.

After receiving "channel set" (S31), PHS telephone 10 sends "confirm" (S32) to exchange control unit 31, and, upon receiving "confirm" (S32), exchange control unit 31 connects PHS telephone 10 to message control unit 32,
10 message control unit 32 sends "replay request" (S34) to message storage unit 33, and the voice message from the caller at public network telephone 1 is played back as "message replay" (S35) to PHS telephone 10.

When the "message replay" (S35) of the voice message
15 from the caller at public network telephone 1 is completed, message control unit 32 sends "replay end" (S36) to exchange control unit 31, and exchange control unit 31 requests PHS telephone 10 to "disconnect" the communication channel (S37).

20 The first effect of the present system is to enable the use of non-ringing call service within service areas in which times and places are defined for which call ringing is not desired so as to eliminate the necessity for designation of message mail service to the PHS exchange
25 from individual PHS telephones. Moreover, the system eliminates the need for PHS telephones to individually request cancellation resetting of message mail service to the PHS exchange.

This effect can be achieved because a PHS telephone automatically designates non-ringing calling to the PHS exchange by merely sending a location registration signal to a base station within a non-ringing calling service area, and non-ringing calling is automatically started and ended by setting the start and end times of non-ringing calling of the service area.

10 The second effect of the present system is to enable notification to a user of a PHS telephone whether or not a call has been received during non-ringing calling, and to allow the user to later hear a voice message that has been stored.

15 This effect can be achieved because the PHS exchange can respond to incoming calls in place of a PHS telephone when non-ringing calling is in effect and store a voice message, and because the PHS exchange can notify the PHS telephone when a voice message has been stored.

20 In summary, the present mobile telephone system enables automatic control within the area of a base station such that call ringing is disabled (the "non-ringing calling" state) according to the times set in the setting timer of the base station. The base station for which non-
25 ringing calling is in effect directs a mobile telephone exchange to effect non-ringing calling for mobile telephones whose locations have been registered within the area of that station. In the event of a call to a mobile telephone from a telephone in a public network

when non-ringing calling is in effect, the exchange control unit responds in place of the mobile telephone and connects
5 the call to a message control unit, and, when the message control unit responds to the telephone call, the caller on the public network telephone may send a voice message. The voice message is stored in the memory of a message storage unit and the exchange control unit simultaneously indicates
10 to the mobile telephone that a call has been received. When a request for playback of the message is received from the mobile telephone by the mobile telephone exchange, the mobile telephone exchange plays back the message from the message storage unit to the mobile telephone.

15 The timer 43 and/or switch 44 may be arranged to be settable in response to signals from the PHS telephone 10. Also, the system may be arranged to respond also to conventional "message mail service set" and "message mail service reset" signals from the PHS telephone 10; typically
20 the state determined by said signals will last until the PHS telephone 10 next calls for a change of state.

It will be understood that the present invention has been described above purely by way of example, and modifications of detail can be made within the scope of the
25 invention.

Each feature disclosed in the description, and (where appropriate) the claims and drawings may be provided independently or in any appropriate combination.

CLAIMS

- 5 1. A mobile telephone system comprising a base station and a mobile telephone exchange that performs exchange and connection between a public network and mobile telephones within a service area of this base station; said base station having control means that exercises setting control
10 of a non-ringing call function that restrains the operation of ringing for calls to a mobile telephone within its service area.
2. A mobile telephone system according to claim 1 wherein
15 said control means comprises means for setting start times and end times of said non-ringing call function.
3. A mobile telephone system according to either previous claim wherein said control means comprises a setting switch
20 that allows the option of manual operation for setting control of said non-ringing call function.
4. A mobile telephone system according to any previous claim wherein said control means comprises means for
25 exercising control such that, when said non-ringing call function is in effect, said non-ringing call function is effected for a mobile telephone within said base station's own service area in response to a location registration request by said mobile telephone.

5. A mobile telephone system according to any previous claim wherein said mobile telephone exchange comprises means for responding to calls to a mobile telephone within a service area of said base station and effecting response control in place of said mobile telephone when said non-ringing call function is in effect, and message storage means for storing messages from a caller, means for indicating to said mobile telephone that a call to said mobile telephone has occurred, and means that, in response to a message playback request from said mobile telephone, plays back a message of said message storage means and sends said played back message to said mobile telephone.

15

6. A mobile telephone system according to any previous claim wherein said mobile telephone comprises means that requests playback of a message stored in said message storage means of said mobile telephone exchange.

20

7. A mobile telephone system substantially as herein described with reference to Figs. 3-7.



Application No: GB 9709903.0
Claims searched: All

Examiner: Gareth Griffiths
Date of search: 18 June 1997

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.O): H4L (LDJ, LDSX)

Int CI (Ed.6): H04M 1/64, 1/65, 3/50, H04Q 7/22, 7/24, 7/26, 7/30, 7/38

Other: Online database: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	WO90/03068 A1 (MOTOROLA) p.5 line 20 - p.7 line 11	1, 5, 6

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.